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RECEIVED JUL 1 1 2019

July 11, 2019

Cascade County Planning Division
121 4th N, Ste. 2H
Great Falls, MT 59401
attn: Sandor Hopkins

RE: ZBOA Questions Pertaining to Special Use Permit Application for Big Sky Cheese, LLC

Dear Mr. Hopkins,

As Mr. Friesen stated during the June 27, 2019 Cascade County Zoning Board of Adjustments meeting, we hereby furnish you with additional information as requested by the Board. The following consists of questions and/or additional information requested by the Board and our responses for each:

1. Q: Board asked about methane gas generation, recapture, and power generation, etc.
   R: The reference to methane gas generation, recapture, etc. was an oversight on BSCE's part and should not have been included in the application. No methane gas generation is anticipated.

2. Q: Board/public asked about the total estimated annual volume of process wastewater generated by the facility.
   R: As per BSCE's response during the ZBOA meeting, the daily process wastewater is estimated to be 13,000 gallons, and the annual volume is anticipated to be 3.38 million gallons. This was a simple typo in one location of the application; the actual, anticipated volumes are correctly listed throughout the supporting documents to the application.

3. Q: Board asked about buffers, landscaping and screening as proposed for the plant.
   R: The applicant proposes to furnish attractive landscaping, including trees, shrubbery, sod, landscape beds and related features to keep the property looking inviting to the general public. The landscaping will meet or exceed any applicable County standards. Please keep in mind the facility is greater than one-mile distant from all area residences and the traveling public.

4. Q: Board asked why the facility location was chosen.
   R: Facility site was chosen, in part, because it provides a location satisfying the criteria for obtaining a Special Use Permit pursuant to the applicable County's zoning regulations. Numerous considerations apply to choosing a site, most of which are not part of the SUP criteria, but include the availability and cost of land, access and transportation considerations, suitability of water and wastewater treatment provisions, and adjacent land uses. The application and resulting staff report explain why this location meets the County's SUP criteria and the possible availability of another site which might also meet the SUP criteria is not a consideration in the review process.

5. Q: Board asked what business licenses are required.
   R: We researched this item and found that no business licenses are required in Cascade County. It is noteworthy to mention that both Madison Food Park and Big Sky Cheese are properly registered and in good standing with Montana's Secretary of State.

6. Q: Board asked about tax abatement.
   R: Based on best available information, tax abatement programs are legislatively created tax relief provisions designed to encourage the growth of businesses according to measures created by the state legislature. The applicant does not have plans currently to apply for any tax abatement program, but the presence or absence of such an opportunity is not the subject of the SUP criteria or a consideration in the review process.

7. Q: Board requested further information regarding waste stream qualities/characteristics, quantities, treatment processes, etc.
   R: Applicant directed HR Green to prepare a brief report regarding wastewater treatment and beneficial reuse; report is attached hereto.

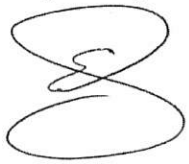
8. Q: Board asked what types of crops would be used for land application.
   R: The applicant will evaluate the most appropriate crops for the property, including alfalfa, grazing grass, as well as other options. The applicant may change the receiving crops from time to time. Any such changes will be compliant with the applicable regulatory requirements.

9. Q: Board again asked about qualities of wastewater and what treatment is needed prior to application on crops.
   R: See response to #7 above.

10. Q: Board requested further information concerning water supply availability and hydrogeology at the subject property
    R: Applicant directed Hydrosolutions to prepare a brief report in response to this request; report is attached hereto.

Sandor, we would like to thank you for giving us an opportunity to respond to these Board questions and requests. We sincerely look forward to seeing you at the upcoming ZBOA meeting.

Respectfully submitted,



Edward Friesen, Managing Member
Madison Food Park

Joseph N. Murphy, P.E.
Big Sky Civil & Environmental, Inc.

Encl. HR Green Wastewater Treatment Report
Hydrosolutions Water Supply Report

HRGreen.

▷8710 Earhart Lane SW | Cedar Rapids, IA 52404
Main 319.841.4000 **Fax** 319.841.4012

▷HRGREEN.COM

July 10, 2019

Mr. Joe Murphy
Big Sky Civil and Environmental, Inc.
PO Box 3625
Great Falls, MT 59403

Subject: Madison Food Park – Cheese Processing – Process Wastewater

Dear Joe:

We would like to take this opportunity to address one of the recent questions discussed in the Madison Food Park permit application public meeting. Please find below additional information on the waste stream qualities/characteristics, quantities, potential treatment process and beneficial reuse of the treated process wastewater effluent. We have also included some information that may be helpful to address potential odors.

The Madison Food Park Cheese Processing waste stream characterization (flow and loading) anticipated to be as follows:

Process wastewater (separate sanitary wastewater collection and treatment) 27 gpm (1 shift) equivalent to approximately 13,000 gallons/day. Please note this is based on:

- Approximately 8,816 lbs/day of cheese production
- 10 lbs milk/lb of cheese
- 8.6 lbs/gal milk density
- 90% of milk whey volume
- 1.2 gal of water/gal of milk

Anticipated process wastewater characteristics based on similar facilities as follows:

BOD	22,600	mg/L
COD	41,300	mg/L
O&G	368	mg/L
pH	4.34	
Temp	22.4	C
Ammonia	28.3	mg-N/L
N	150	mg/L
Phosphorus	60	mg-P/L
Calcium	429	mg/L
Magnesium	60.8	mg/L
Sodium	706	mg/L
Potassium	845	mg/L
Iron	19	mg/L

TDS	2,500	mg/L
TSS	1,710	mg/L
VSS	1,710	mg/L

Note: This is a hybrid of data from similar facilities in Canada and Wisconsin.
Note: Incoming milk characteristics directly impact the process wastewater characteristics. Therefore, changes in diet and other factors external to the facility have the potential to impact incoming waste streams which makes a complete system design infeasible at this time. The wastewater treatment system proposed for the facility is capable of adequately treating wastewater of various characteristics and concentrations to Montana DEQ standards and may need to be adjusted periodically to accommodate changes in milk sources/qualities. Additional information is included below.

Proposed Treatment
Wastewater treatment will be completed onsite using Montana DEQ-approved wastewater treatment system(s). Commonly practiced treatment technologies will be used for managing both domestic and process waste streams, and beneficial reuse of treated effluent will be performed in a manner that is compliant with DEQ and local government regulations. The overall volume of process wastewater generated from dairy operations is estimated at approximately 13,000 gallons per day (gpd). With the 5 day/week operation, this will result in approximately 3.38M gallons of process wastewater each year.

MFP may employ a technology called acidification to treat process wastewater before seasonal storage and beneficial reuse via land application / irrigation. Acidification is a robust, automated process commonly utilized at dairy processing facilities and primarily consists of the following:

- Equalization
- pH adjustment
- Dissolved Air Floatation
- Sedimentation
- Solids dewatering (as needed)

The acidification process equipment, if deemed necessary, will be housed inside the processing facility before exiting to the seasonal storage ponds. The process wastewater will be pretreated using nutrient reduction/removal technologies, then stored in holding pond(s) approximately 2-3 acres in size, followed by beneficial reuse for seasonal land application of treated effluent on approximately 10-15 acres of cropland, either onsite or on adjacent farmland. The land application rate of the treated effluent will be balanced with the crop uptake rates of nutrients such as nitrogen and phosphorous. The irrigation areas shown on the proposed site plan are conservatively oversized to allow for a variety of crops to be utilized based on nutrient uptake rates while also allowing for system flexibility with changes to incoming milk characteristics; i.e. changes in wastewater treatment will not impact the ability to beneficially reuse treated effluent since ample areas have been reserved for irrigation.

HRGreen

Mr. Joe Murphy
July 10, 2019

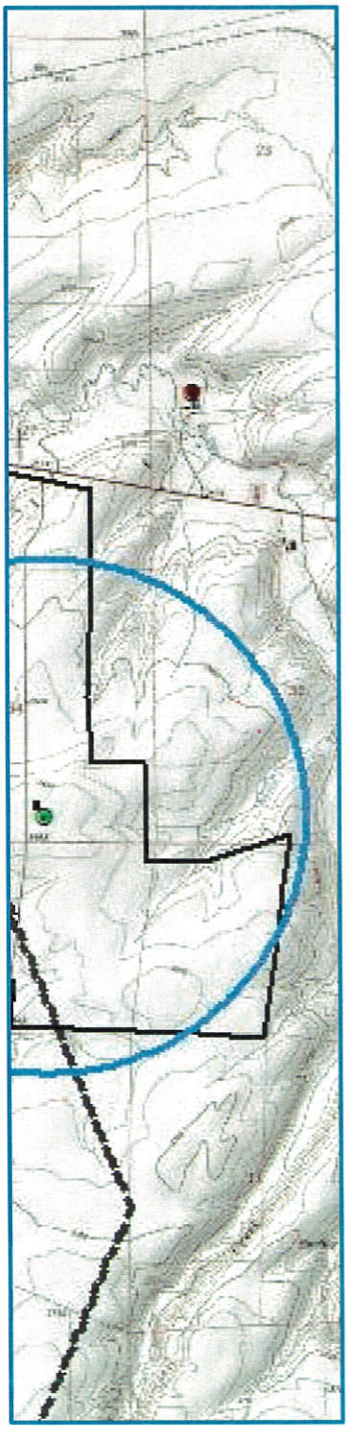
Methods of addressing and reducing potential odors include the following:

1. Process wastewater will flow immediately to treatment, i.e. process wastewater will be treated immediately as it is produced. There will be no storage of raw/untreated process wastewater. Note: eliminating the storage of raw/untreated wastewater will help alleviate odor production potential within the wastewater.
2. Process wastewater treatment equipment will be housed inside the facility in an environmentally controlled space. The exhaust air from the wastewater treatment facilities can be filtered/treated as needed to mitigate and address odor concerns.
3. Process wastewater may be treated with the acidification process before being discharged to the seasonal storage pond.
4. Process wastewater solids will be collected and stored inside the facility and hauled off-site for disposal as needed to avoid potential odors from solids produced.
5. The seasonal storage pond may be aerated if needed to mix and aerate treated process wastewater prior to beneficial reuse seasonal land application. A number of alternative mixing and aeration systems will be reviewed and considered if deemed necessary by the regulatory authority (MDEQ); optional systems consist of floating aerators, submerged course or fine bubble diffused aeration. Please note that adequately sized process wastewater aeration in the storage pond will help to maintain an aerobic state rather than anaerobic where organic matter is transformed into biogas.
6. The seasonal storage pond is anticipated to be frozen for some of the year with very little potential for odors during this time.

Please let me know if you have further questions or comments on the proposed process wastewater treatment for the Madison Food Park cheese processing facility.

Sincerely,
HR GREEN, INC

Andrew Marsh, P.E. (licensed in AZ, IA, IL, MN, NE and GA)
Vice President



MADISON FOOD PARK, LLC
DAIRY/CHEESE PROCESSING FACILITY

ASSESSMENT OF POTENTIAL ADVERSE EFFECTS FROM PUMPING PROPOSED WATER SUPPLY WELLS

PREPARED FOR:

Madison Food Park, LLC

July 8, 2019

PREPARED BY:

Celebrating 20 years HydroSolutions est. 1999

303 Clarke Street | Helena, MT 59601 | 406.443.6169
www.hydrosi.com

Introduction

Madison Food Park, LLC (MFP) proposes construction of a dairy and cheese processing facility (Facility) in Cascade County southeast of Great Falls, Montana. Estimated daily water needs are 13,000 gallons, so the Facility would require about 10 acre-feet per year based on 260 workdays annually. To provide the necessary water supply, two water supply wells are proposed. Both wells are expected to be completed in the Madison Formation (Madison) at depths of approximately 500 feet. As part of the due-diligence process, HydroSolutions Inc (HydroSolutions) evaluated the potential adverse effects these pumping wells could have on other area wells. Both wells would be filed through the Montana Department of Natural Resources (DNRC) using Form 602 – Notice of Groundwater Development. These notices are for wells pumping up to 35 gallons per minute (GPM) and 10 acre-feet (AF) per year and are exempt from DNRC permitting. Exempt wells serving a common project must be located at least one-quarter mile apart and cannot be manifold into a common conveyance or storage system.

Evaluation Model and Parameters

To evaluate the expected drawdown in the proposed water-supply wells, the computer software AQTESOLV® (Duffield, 2007) was used in a forward-solution model. The proposed site for the Facility is SW.SE Section 34, T20N, R5W, Cascade County (Figure 1). To provide a reasonable assessment of drawdown in wells, a model must use aquifer parameters that accurately reflect the nature of the aquifer where the wells are installed and where impacts are expected. The best aquifer parameter values, specifically hydraulic conductivity (K), transmissivity (T), and storativity (S), are derived from aquifer testing in nearby wells completed within the same source aquifer.

The closest Madison well with pumping test data is located at Hill Top Colony, approximately 3 miles south of the proposed plant (Figure 1). In February 2012, one of two Hill Top Colony public supply (PWS) wells was tested for 76.45 hours at a rate of 130 GPM from six-inch casing. Because the pumping test produced immediate stabilization in the pumped well (PSW 2, 890 feet deep) and no drawdown occurred in the monitoring well (PWS 1, 920 feet deep), reasonable values of K, T, and S values could not be estimated. Based on these results, DNRC recommended using aquifer test data from Madison wells at Montana Prairie Nest (MPN), located about 7.5 miles northeast of the proposed Facility. The aquifer test was completed at a pumping rate of 350 GPM for 72 hours from the 800 foot well with 8-inch casing. Analysis of MPN aquifer test data by the Montana Bureau of Mines and Geology produced an average T value of 22,600 ft^2/day and an average S value of 0.0073 (Chandler et al., 2011). Data were analyzed using AQTESOLV and three leaky-confined aquifer models; Hantush-Jacob (1955)/Hantush (1964) without aquitard storage, Hantush (1960) early time, and Hantush (1960) with aquitard storage. A discussion with Kevin Chandler indicates that these solutions best fit all the Prairie Nest pumping test data, even though a major assumption of these solutions is an overlying aquifer having a constant head source. It is possible that the overlying Kootenai Sandstone and other water-bearing units help satisfy this condition.

Four miles to the southwest of the project area (Figure 1), the Town of Sand Coulee drilled a new PWS well (Well 5) in April 2012. This 785-foot well with 8-inch casing was tested for 24 hours at a pumping rate of 145 GPM. The AQTESOLV analyses of pumping test data using the Theis (1935)/Hantush (1961) confined and Gringarten-Ramey (1974) horizontal fracture

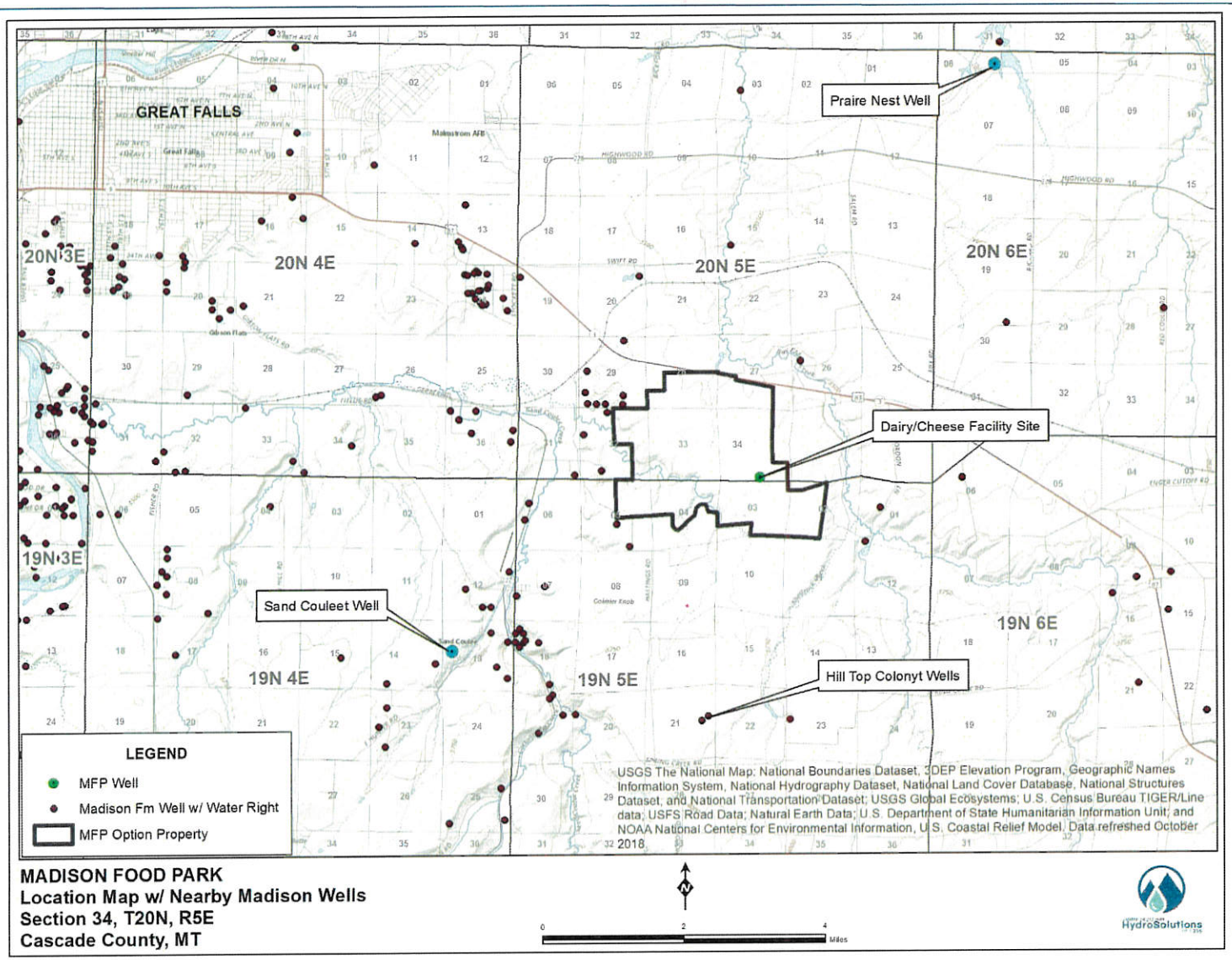

GREAT FALLS
Malmstrom AFB
Praire Nest Well
Dairy/Cheese Facility Site
Sand Couleet Well
Hill Top Colonyt Wells
20N 3E
20N 4E
20N 5E
20N 6E
19N 3E
19N 4E
19N 5E
19N 6E
LEGEND
MFP Well
Madison Fm Well w/ Water Right
MFP Option Property
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed October 2018.
MADISON FOOD PARK
Location Map w/ Nearby Madison Wells
Section 34, T20N, R5E
Cascade County, MT
0
2
4
Miles
HydroSolutions

Figure 1

solutions both produced K estimates between 4,000 and 5,000 ft/day Hydrometrics (2012). Based on an aquifer thickness of 356 feet, the resulting T value exceeds 1.4 x 10^6 ft^2/day (T = K times aquifer thickness).

Modeling Results

Based on the results of the two pumping tests described above, HydroSolutions prepared two AQTESOLV (Duffield, 2007) models to evaluate the extent of drawdown in a hypothetical well at the proposed processing plant. Both models use a conservative T value of 10,000 ft^2/day and a S value of 0.007. Both models use 70 GPM pumping rates over a continuous five-year pumping period with a single fully penetrating well and a 50-foot thick exposed aquifer in the Madison Formation. Although two 35 GPM wells are anticipated to supply the proposed Facility, the models assume a single well with six-inch casing.

Model 1 – The first model uses the Hantush-Jacob (1955)/Hantush (1964) solution (single solution within AQTESOLV) for a pumping test in a leaky aquifer with no aquitard storage. This solution was one of three Hantush-type solutions used by MBMG in the Montana Prairie Nest analysis discussed above. The model solution assumes the following:

- aquifer has infinite areal extent
- aquifer is homogeneous and of uniform thickness
- pumping well is fully or partially penetrating
- flow to pumping well is horizontal when pumping well is fully penetrating
- aquifer is leaky confined
- flow is unsteady
- water is released instantaneously from storage with decline of hydraulic head
- diameter of pumping well is very small so that storage in the well can be neglected
- confining bed(s) has infinite areal extent, uniform vertical hydraulic conductivity and uniform thickness
- confining bed(s) is overlain or underlain by an infinite constant-head plane source
- flow is vertical in the aquitard(s)

Table 1 and Figure 2 provide drawdown vs. distance results predicted by the model. As shown, maximum drawdown is 1.1 feet adjacent to the well. At 1,000 feet, only 0.03 feet of drawdown is expected. Because drawdown is directly proportional to the T value, drawdown values double if modeled transmissivity is reduced to of 5,000 ft^2/day. Conversely, if T is doubled (i.e., values derived at Prairie Nest), drawdown would halve.

Distance (ft)	Drawdown (ft)
1	1.1
10	0.67
100	0.22
1000	0.03

Table 1

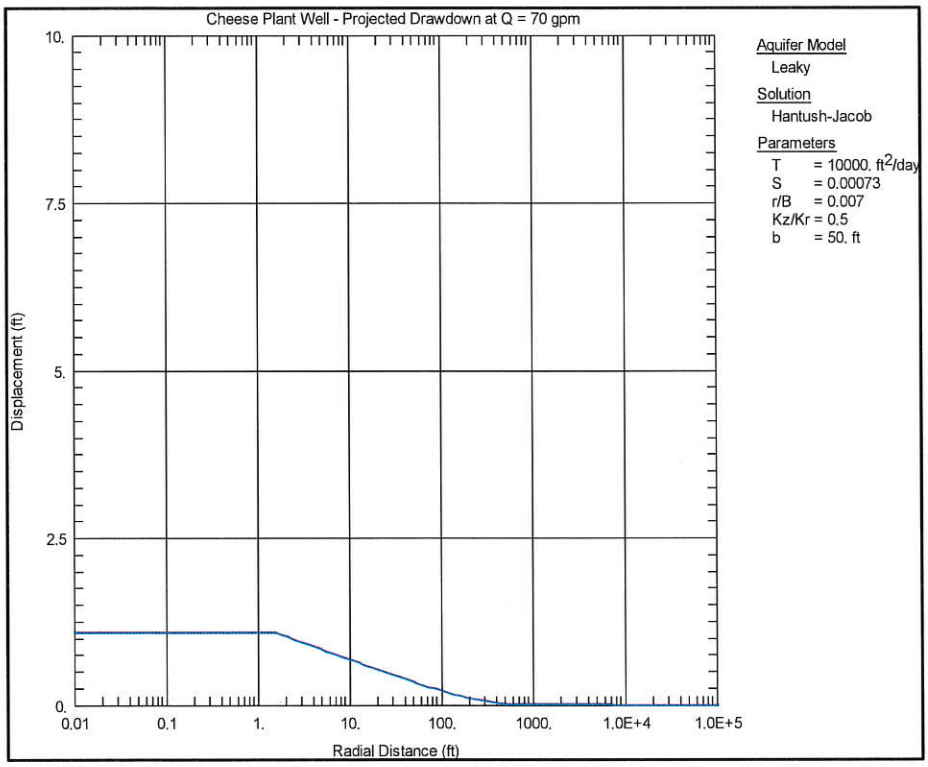


Figure 2

To provide a second, more conservative estimate, the model was rerun using the Neuman-Witherspoon solution for a leaky aquifer.

Model 2 – The second model uses the same conservative T value of 10,000 ft^2/day, an S value of 0.007, and a 70 GPM pumping rate for five continuous years to model drawdown. A single, fully penetrating well with a 50-foot thick aquifer with the Madison Formation were again assumed. The Neuman-Witherspoon solution makes the following assumptions.

- aquifer has infinite areal extent
- aquifer is homogeneous, isotropic and of uniform thickness
- pumping well is fully penetrating
- flow to pumping well is horizontal
- aquifer is leaky confined
- flow is unsteady
- water is released instantaneously from storage with decline of hydraulic head
- diameter of pumping well is very small so that storage in the well can be neglected
- confining bed(s) has infinite areal extent, uniform vertical hydraulic conductivity, storage coefficient and thickness
- flow is vertical in the aquitard(s)

To determine realistic aquifer parameters other than the conservative T value used, data obtained from MBMG for the Roehm Well test at Prairie Nest were used. Within AQTESOLV, the MBMG solution from the Roehm Well was changed from the Hantush-Jacob (1955)/Hantush

(1964) solution to the Neuman-Witherspoon solution to derive the parameters S (0.006 - storativity), r/B, (0.057 - leakage), β (0.1 - leakage) T_2 (1440 ft^2/day - T in unpumped aquifer), and S_2 (0.001 - S in unpumped aquifer). These parameters were then used in a forward model using the Neuman-Witherspoon solution to again predict drawdown in the hypothetical well.

Table 2 and Figure 3 provide drawdown vs. distance results predicted by the model. Table 2 provides the results of the two models together for reference. As shown for the second test, maximum drawdown is 2.3 feet adjacent to the well and decreases to 0.7 feet 1000 feet from the hypothetical well.

Distance (ft)	Hantush-Jacob Drawdown (ft)	Neuman-Witherspoon Drawdown (ft)
1	1.1	2.3
10	0.7	1.5
100	0.2	1.1
1000	0.3	0.7

Table 2

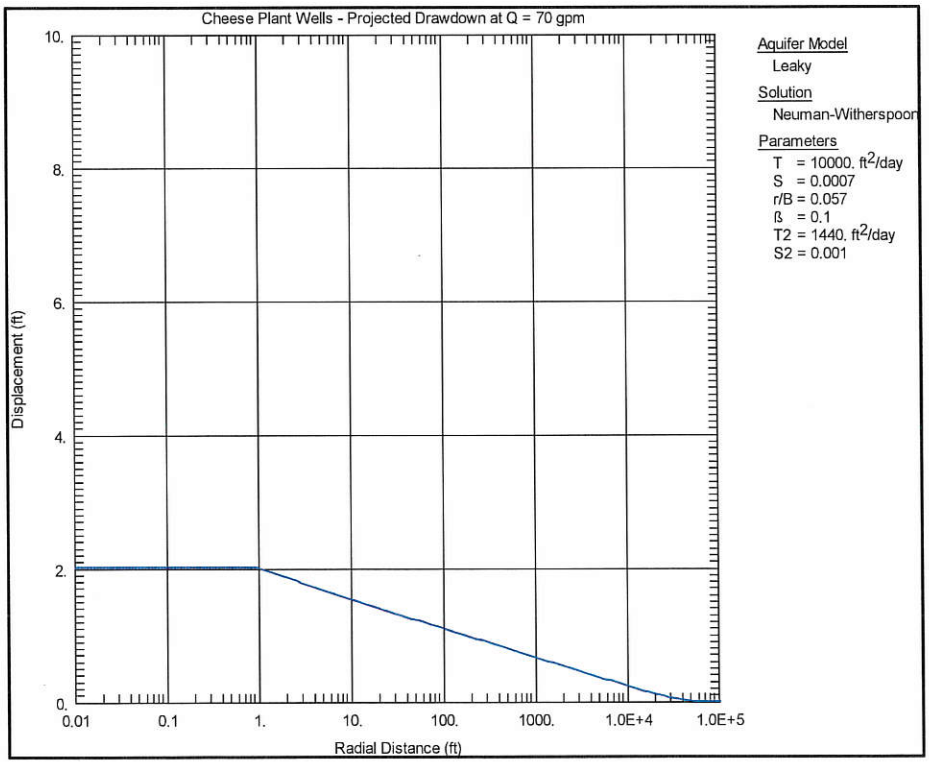


Figure 3

Based on forward-prediction modeling, maximum expected drawdown from pumping the Facility wells is 2.3 feet or less after five years of continuous pumping at 70 GPM.

Conclusions of Potential Adverse Effect

Figure 4 shows the location of the Facility and a hypothetical new well with a buffer radius of one mile, a distance reflecting a maximum modeled drawdown of 0.37 feet. This figure also shows nearby water rights claiming the Madison Formation as the source aquifer. The closest wells drilled into the Madison are about 1.7 miles away.

Based on forward modeling of expected drawdown in the proposed new well(s), no adverse effects to other wells are expected. This analysis is conservative for the following reasons:

1. Conservative aquifer parameters were used in the model;
2. A continuous pumping rate of 70 GPM was used. This would be the maximum pumping rate available from the two exempt wells. Although it is expected that one well will pump at about 25-30 GPM to provide water for the processing Facility, the second well, which will be utilized for domestic use, will likely pump at a rate below 25 GPM;
3. The modelled drawdown was based on a continues pumping period of five years. Actual expected use is 260 days of operation per year.

If permitted (non-exempt) wells are required, potential depletions at the Missouri River at Great Falls will be offset with a water service contract from the U.S. Bureau of Reclamation (BOR) to replace all water pumped from the Madison. The BOR mitigation water would be released from Canyon Ferry Reservoir storage into the Missouri River.

References

Chandler, K., Kuzara, S., Reiten, J., 2011. Madison Aquifer Test, Prairie Nest Irrigation Well, Great Falls, MT, unpublished MBMG document.

Duffield, G.M., 2007, AQTESOLV for Windows Version 4.50, HydroSOLVE, Inc., Reston, VA.

Hydrometrics, Inc., 2012, Sand Coulee Water District Public Water Supply Well Installation Final Report. Prepared for Montana Department of Environmental Quality.

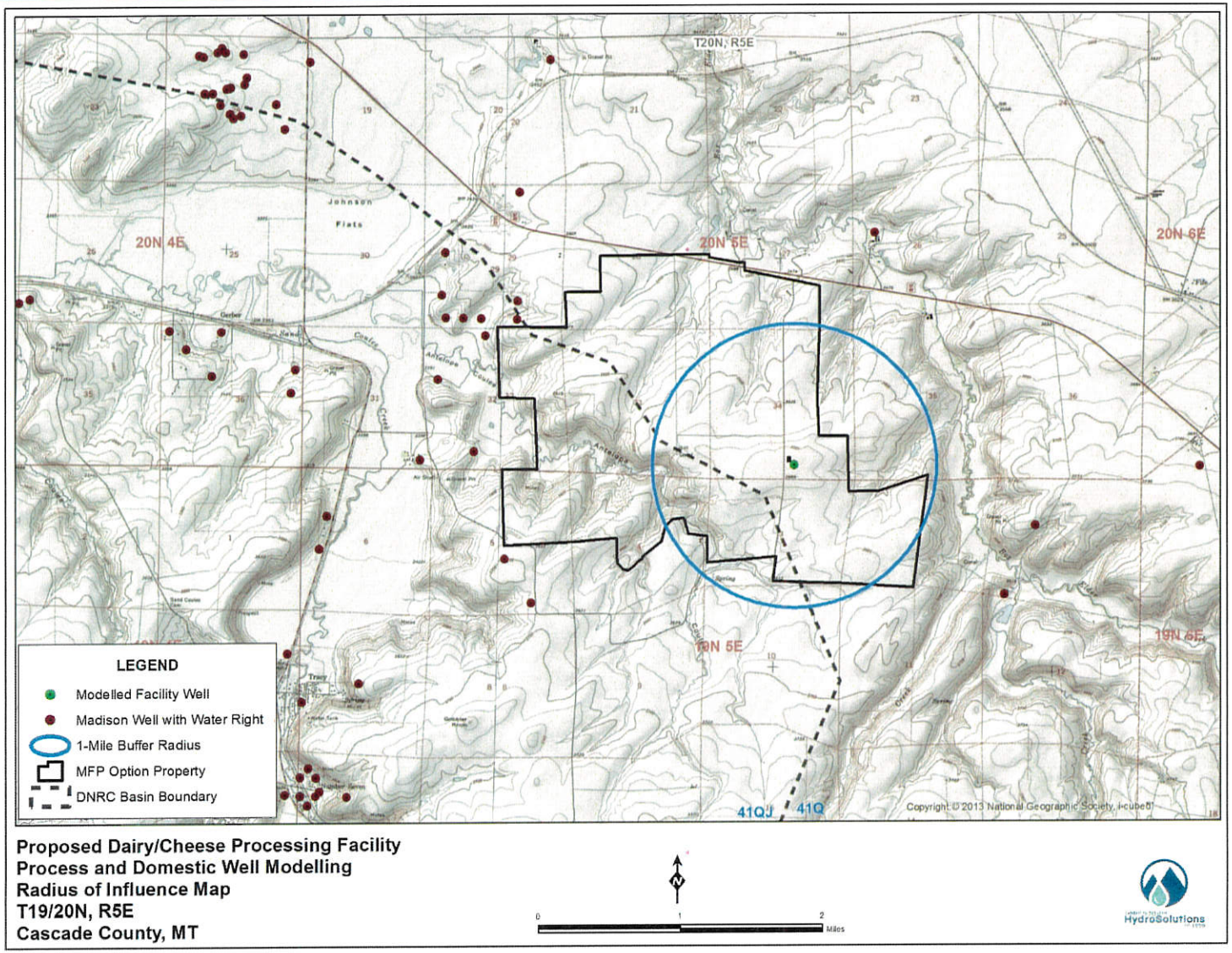

T20N, R5E
20N 4E
20N 5E
20N 6E
19N 5E
19N 6E
Johnson Flats
Tracy
41QJ
41Q
LEGEND
Modelled Facility Well
Madison Well with Water Right
1-Mile Buffer Radius
MFP Option Property
DNRC Basin Boundary
Copyright © 2013 National Geographic Society, i-cubed
Proposed Dairy/Cheese Processing Facility
Process and Domestic Well Modelling
Radius of Influence Map
T19/20N, R5E
Cascade County, MT
0
1
2
Miles
HydroSolutions

Figure 3